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PERSPECTIVES ON EXCELLENCE IN COMMUNITY RELATIONS | ISSUE 1 2022

- LANL-to-go delivers interactive Lab experience to area communities
- New program supports opportunities for Indigenous women in physics
- Recognizing exemplary achievement in pollution prevention



CONTENTS

- 1 From Toni's desk
- 2 LANL-to-go: New outreach program to deliver an interactive Lab experience to state, regional communities
- 4 Supporting opportunities for Indigenous women in physics
- 5 Meet Carl Cady
- 6 Recognizing exemplary achievement in pollution prevention
- 8 Putting a face on a career at the Laboratory

Members of Accelerator Operations and Technology (AOT) Division recently installed a new Isotope Production Facility (IPF) target position mechanism. The mechanism's chain and control system were both new, necessitating that all participants were in constant communication to coordinate this high-risk operation. The extensive testing, critical path preparation, and installation relied on teams from Chemistry, AOT, and Maintenance and Site Services divisions working closely together to achieve success. Here, Mario Pacheco, Jason Burkhart, and Brandon Roller install the new chain into the magazine mounted inside the IPF hot cell.



Physical Sciences Directorate

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On the cover: Exterior and interior views of the Challenge Tomorrow travel trailers.

FROM TONI'S DESK

Toni Taylor, Associate Laboratory Director for Physical Sciences



I am excited to introduce the new issue of *Physical Sciences Vistas*, which focuses on our directorate's efforts toward "excellence in community relations."

Our accomplishments in this area contribute to the institution as a whole being recognized as "a force for good" by our Northern New Mexico neighbors and trusted by stakeholders to perform missions with minimal operational issues. Being "a force for good" is 1 of the 13 critical outcomes outlined in the newly updated Lab Agenda. Together, these initiatives allow us to achieve the Lab's strategic objectives of nuclear deterrence, threat reduction, technical leadership, and trustworthy operations.

In this issue, highlights of our contributions and outreach to our surrounding communities and the scientific community include descriptions of the following.

- A newly funded program supporting undergraduate Indigenous women interested in a career in physics. The program will strengthen the field of nuclear physics by broadening the pool of talent and giving voice to new perspectives. Astrid Morreale, Cesar Luiz da Silva, and Krista Smith are co-principal investigators.
- The diligent work of our staff across the directorate to enhance the Lab's environmental posture. For their work in minimizing waste, conserving resources, or preventing pollution, these dedicated individuals were recognized with Patricia E. Gallagher Environmental Awards.
- A regional billboard campaign that draws attention to the diversity of career opportunities available at the Lab. The signs highlight a range of Lab staff members including our own Wanyi Nie and Alejandra Loya-Munoz.
- The noteworthy contributions of Carl Cady. For his dedication to The Minerals, Metals, & Materials Society Cady is the recipient of its 2022 Alexander Scott Distinguished Service Award.
- And finally, as featured on the issue's cover, our staff's contributions to the Lab's Challenge Tomorrow outreach program. This engaging, educational exhibit will bring an interactive Lab experience to communities across the region. The travel trailers showcase some of the discovery science and mission operations work done at the Lab, including research by staff at the Center for Integrated Nanotechnologies. I encourage anyone interested in fostering STEM (science, technology, engineering, math) education within our communities to consider serving as a Challenge Tomorrow Ambassador. For more information, please see the story on page 2.

As we head into the second half of the fiscal year, I would like to thank all of you for your dedication to simultaneous excellence—ensuring our quality work is completed on time, safely, and securely. Your sustained commitment is essential to us fulfilling the Lab's mission of solving national security challenges.

Toni



In each Challenge Tomorrow trailer, visitors will be able to explore different areas of the Lab's ongoing work—from quantum dots, to the tech behind the Mars rover, to environmental research, and more. Here, the Mission Ops trailer (at left) is shown outfitted with a glovebox and block-stacking manipulator arm, offering visitors a hands-on experience.

LANL-to-go: New outreach program to deliver interactive Lab experience to state, regional communities

With their bold graphics and vibrant colors, the Challenge Tomorrow travel trailers don't look to be typical lab environments. In contrast, the experimental setups and displays, such as a vacuum gas manifold—or “Schlenk line” with pumps, ports, and traps—or a monitor showing the Mars rover on the surface of the Red Planet, are instruments and setups very familiar to Lab researchers.

That mix of flash and fact is the point.

The two travel trailers are the centerpiece of a new educational outreach and community engagement program encouraging the public to learn about the range of LANL's research and career opportunities.

Providing an interactive “Lab-on-wheels” experience, the Challenge Tomorrow Program comprises two themed trailers—Discovery and Mission Ops. Once pandemic conditions allow, the trailers will head out to schools, fairs, and recruitment events throughout the state and region. Visitors will interact with Challenge Tomorrow Ambassadors—volunteers from all specialties across the Lab. “There's a lot of mystery in our communities about the Lab. ‘What do they do up on the hill?’” said Bradbury Science Museum Director Linda Deck,

who led the effort. “This is a way to share our work outside of Los Alamos.”

Lending a hand

Indeed, the care taken to accurately represent that work shines through in the trailers' displays. Members of the Center for Integrated Nanotechnologies (MPA-CINT) played a key part in ensuring sections related to materials science were authentic and engaging.

For example, a display in the Discovery trailer shows how quantum dots with only a slight size difference emit different colors of light. These semiconductor nanocrystals have applications in optics and electronics. In the Mission Ops trailer, that mock Schlenk line offers visitors a chance to see up close tools and equipment used in materials and chemistry research.

Striking a balance between real and relatable is key to the exhibit's success across a range of ages, according to MPA-CINT research technologist Chris Sheehan. With young audiences, “a big ‘wow’ factor would be great,” he said. “They are learning something and getting excited about science.” For

LANL-to-go continued ...

those students exploring careers, the trailers “show just how diverse the work at the Lab is and how many opportunities there are here.” Sheehan, who admitted that as a child he was inspired by Carl Sagan’s “Cosmos” television series, said, “Creating a spark in somebody who decides to take on a career in science would be super rewarding personally.”

As a postdoctoral researcher at the University of Wisconsin, Andy Jones led students in hands-on chemistry demonstrations. His work developing an interactive video for the nanomaterials display is part of his continued desire to “ensure the pathway for people of all different backgrounds to pursue science is open and encouraging.” Jones said his specialty, in non-technical terms, is “studying how really tiny things respond to light.” The MPA-CINT staff scientist is eager to show others “how if we can control and manipulate things we currently don’t understand, we can open a lot of doors to improvements in electronic and optical devices in the future.”

Expanding on his outreach work as a graduate student at the University of California, Santa Barbara, Dean Morales is formulating demonstrations showing the benefits of translating nanoscience in biology. As a Challenge Tomorrow Ambassador, the MPA-CINT staff scientist said, “science outreach reminds me that my research is not just a job. We are trying to make improvements all around the world for people.” ■



To help visitors grasp the tiny scale of a nanometer, Chris Sheehan suggested a “giant” strand of hair, shown here as the framework for an exhibit on nanoscience. “Your actual hair is as big as 10 nanometers, relative to the hair model,” he said.

Become a Challenge Tomorrow Ambassador

As a Challenge Tomorrow Ambassador, you will share with our communities amazing LANL experiences when the outreach program hits the road this year. To learn more about volunteering, ambassador training, and involvement, visit the Bradbury Science Museum’s internal web page.



Above: A mock Schlenk line like the kind used for quantum dot synthesis is featured in the Mission Ops trailer. In the background are mannequins in Level B and C hazmat suits with gloves, booties, and monitoring equipment. Below: Bradbury Museum Director Linda Deck (left) and LANL Director Thom Mason cut the ribbon at the program’s launch in December.



Get the details

The Challenge Tomorrow Program is an initiative of the Community Partnerships Office. Organizers drew inspiration from a successful traveling program at Oak Ridge National Laboratory with which LANL Director Thom Mason was familiar from his time in Tennessee. Physical Sciences Directorate participants in the Challenge Tomorrow Program include Center for Integrated Nanotechnologies’ (MPA-CINT) Stacy Baker, Anastasia Blake (now International Threat Reduction, NEN-3), Jennifer Hollingsworth, Andy Jones, Dean Morales, Adam Rondinone, and Chris Sheehan. Technical contact: Linda Deck

Supporting opportunities for Indigenous women in physics

Indigenous women are the most underrepresented group in physics

A newly funded program at Los Alamos National Laboratory, in collaboration with Fort Lewis College, supports undergraduate Indigenous women interested in a career in physics. Offered to two women per year majoring in physics at the Colorado school, the program aims to build a pipeline of talent from the undergraduate level in the Four Corners region to graduate programs and eventual careers in physics, including at national laboratories such as Los Alamos.

“Indigenous women are the most underrepresented group in physics degree completion and careers, and we’re in a region where the demographics are heavily Native American,” said Co-Principal Investigator Astrid Morreale (Nuclear and Particle Physics and Applications, P-3). “It’s a bit of an incoherence, where we’re here doing high-level science and engineering, yet still underrepresented groups are either not coming to us or we’re not bringing them in. This program represents an effort to turn that around.”

Two participants have been selected as the first cohort in the program. Julie Nelson, a senior at Fort Lewis College, is majoring in engineering and math with an emphasis in physics and is a member of the Cheyenne River Sioux Tribe.

“This internship and the research I am privileged to participate in will be the first steps I take in pursuit of a career in physics,” said Nelson. “Obtaining the knowledge no longer seems out of reach because of this opportunity. I am thrilled to get hands-on experience at Los Alamos National Laboratory and explore the research side of academia while collaborating with scientists and mentors about the contributions of nuclear and particle physics that can benefit humanity.”

Arielle Platero, a junior at Fort Lewis College, is also majoring in engineering and math with an emphasis in physics and is a member of the Navajo Nation.

“As a Navajo woman in the STEM (science, technology, engineering, math) field, I am very excited to work with the Los Alamos team because it gives me an opportunity to contribute to and to help pave the way for new and exciting physics discoveries,” said Platero. “I am looking forward to continuing on this path to graduate school and to representing my tribe and showing the younger generation that we can do great things if we apply for these opportunities and put in the work.”



Julie Nelson



Arielle Platero

The students will receive year-round mentoring from Laboratory physicists in the course of their education at Fort Lewis College. The program includes a 10-week internship in Los Alamos and a two-week visit to CERN, the European Council for Nuclear Research. Students will also be able to participate in the American Indian Resource Group that promotes access to Native American resources and a sense of community and inclusion while learning about high-energy nuclear physics at the Laboratory.

While the program aims to help Indigenous women advance in physics, Morreale stresses that the Laboratory and the field of physics have much to gain by bolstering participation from underrepresented groups. “We don’t see this program as the Laboratory just helping students,” Morreale said. “We need them. They would help us if they came here. We want to have different ideas and different points of view in our discipline. We’re trying to help our field by bringing in new talent and perspectives.”

The program is funded by the DOE Office of Science, Nuclear Physics, for two years and began in November.

During their Laboratory internship program, participants such as Nelson and Platero will conduct gluon saturation research, seeking to discover a new state of matter in which gluons are densely packed and give rise to properties not unlike ordinary glass. Gluons are fundamental particles that glue all visible matter together and can be studied with detectors being constructed at Los Alamos and then deployed at the

continued on next page ►

Supporting opportunities continued ...

Large Hadron Collider at CERN. The participants will work alongside Morreale and Co-Principal Investigators Cesar Luiz da Silva and Krista Smith (also P-3).

A highlight of the program is a two-week visit to CERN, the largest particle physics laboratory in the world. Students will descend more than 300 feet below the French countryside to tour one of the detector experiments at the Large Hadron Collider, which investigates the properties of subatomic particles, and spend time reviewing data collected and interacting with the global cohort of students and researchers who come to work at CERN. ■

“We don’t see this program as the Laboratory just helping students. We need them. They would help us if they came here. We want to have different ideas and different points of view in our discipline. We’re trying to help our field by bringing in new talent and perspectives.”

Astrid Morreale



Astrid Morreale (top right), Cesar Luiz da Silva (above left) and Krista Smith (above right) are co-principal investigators on the project “Engaging Indigenous women into gluon saturation searches in nuclei.” The project is part of a DOE Office of Science, Nuclear Physics, effort to develop research traineeships to broaden and diversify the field of nuclear physics.

R&D Scientist, Materials Science in Radiation and Dynamics Extremes (MST-8)

MEET CARL CADY

For his outstanding contributions to The Minerals, Metals & Materials Society (TMS) Carl Cady is the recipient of its 2022 Alexander Scott Distinguished Service Award. Named for the TMS executive director who served from 1973 to 2008, the annual award recognizes a member’s devotion of time, effort, thought, and action to further TMS’s mission through administrative and functional activities.



TMS cited Cady for “dedicated and sustained service to TMS and its members, particularly to improvements in the quality of programming at TMS Annual Meetings and at Materials Science & Technology conferences.” He is also the recipient of TMS’s Structural Materials Division Distinguished Service Award, for his “generosity, community focus, work ethic, and respect for others—all characteristics of spirit of service.”

For more than two decades, Cady has volunteered as both an active member and a dedicated leader on a variety of TMS committees and on the TMS Board of Directors. This includes his decade-long tenure on its Programming Committee, where as TMS programming liaison to the Materials Science & Technology conference, he engaged with members of partner societies in organizing this wide-ranging international technical forum. He has also been a consistent advocate for member interests as changes in programming policy have been implemented.

And it’s not just to his professional duties that Cady is dedicated. In 2020, the New Mexico High School Coaches Association named Cady Coach of the Year for swimming and diving. Cady has coached the Los Alamos girls and boys teams for 20 years. He has also volunteered his time as association president at one of the town’s community pools.

Cady earned a PhD in materials science and engineering from the University of California, Santa Barbara. He is a member of the MST-8 Dynamic and Quasi-Static Loading (Experimental) Team, where his research focuses on mechanical behavior of materials under extreme conditions. ■

Recognizing exemplary achievement in pollution prevention

For their exemplary environmental stewardship, Physical Sciences Directorate members were recently recognized with 2021 Patricia E. Gallagher Environmental Awards. The annual awards recognize individuals or teams whose efforts have minimized waste, conserved natural resources, or prevented pollution.

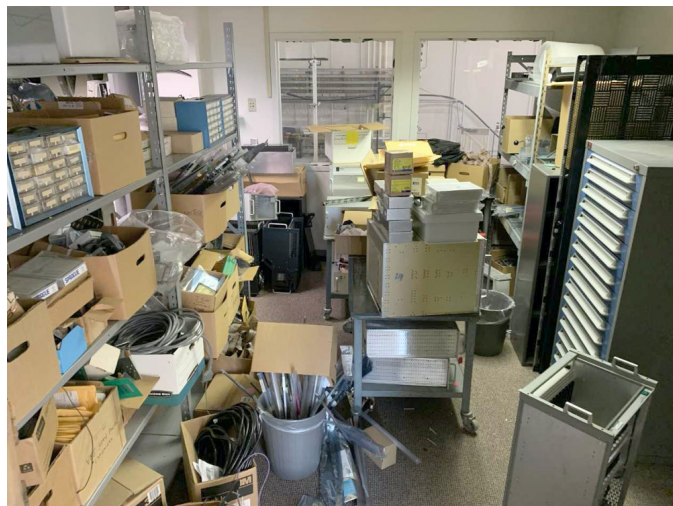


Gold Award, a special recognition category

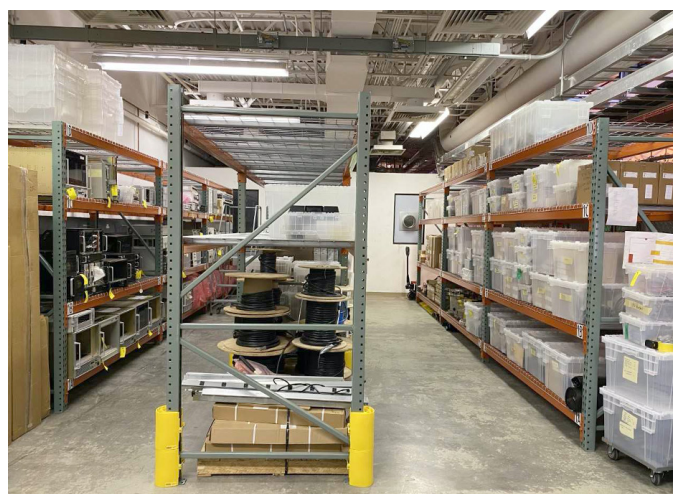
Receiving a Gold Award were Brian Scott (Materials Synthesis and Integrated Devices, MPA-11) and Justin Pagano (Finishing Manufacturing Science, Sigma-2) for their work on the “Stabilization of Uranium Metal By Chloride Conversion” Team. Gold-level pollution prevention awards are a special recognition category of the environmental awards and the projects were the highest ranked against the award criteria. The nine-member team also included members of the Chemistry, Earth, and Life Sciences (ALDCELS) and Weapons Engineering (ALDW) directorates.

This team developed a facile, safe, and economical way to treat depleted uranium (DU) metal chips to purify and recover the metal in a two-step chemical process, producing uranium tetrachloride (DUCl_4) and pure DU metal. According to NNSA estimates, the nation has a limited supply of DU metal feedstock and current supply will be exhausted in the late 2020s. NNSA expects to spend upwards of \$200M in the next three years under the DU Modernization Program. The team developed a process that selectively dissolves DU chips in solution to form DUCl_4 . This directly improves worker health and safety compared to current approaches. The reduction of DUCl_4 to form DU metal has garnered the attention of the DU Modernization Program for metal recovery operations. This source reduction technology will reduce the pyrophoric DU waste volume by more than 90% within the next three years.

The unique recycling process could become commercially relevant and available within five years and is expected to transform DU recovery operations across the DOE Complex. The selectivity of the process to only dissolve uranium and leave behind common contaminants such as carbon, silicon, and titanium translates to considerable positive environmental impact and cost savings for the nation.



Before (above) and after (below) photos of the multi-type storage space reduction project. The silver-award-winning effort has created much-needed space for the Lab's Enhanced Capabilities for Subcritical Experiments Program.



Silver Award recipients

Physical Sciences Directorate staff were members of two teams receiving Silver Awards for eliminating waste, reducing risk, and improving safety.

Simon Johnson, Vince Kutac, and Anthony Valdez (all Instrumentation and Controls, AOT-IC) took on the heroic task of cleaning out 1,500 square feet of storage space in a building on the Los Alamos Neutron Science Center (LANSCE) mesa. The three-member crew worked after hours and on weekends with the goal of creating much-needed space for the Enhanced Capabilities for Subcritical Experiments Program, a high-priority LANL project. With assistance from ReUse personnel

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Recognizing exemplary continued ...

and the LANSCE property specialist, they improved the space to benefit operational effectiveness and safety.

The “Proton Storage Ring Cleanout” Team staged the disposition of highly activated and potentially contaminated waste generated as part of beamline operations at the LANSCE proton storage ring. Such material has historically been difficult to remove due to ALARA (as low as reasonably achievable) and operational constraints. Over the course of 10 months, the team coordinated with beamline operations, maintenance, waste management, and radiation protection personnel to ensure a safe and compliant removal of the material. Participants included James O’Hara, Walter Barkley, Brandon Roller, Mario Pacheco, Jason Burkhart, David Ballard, and Manuel Soliz (all Mechanical Design Engineering, AOT-MDE); Kelsey Arcocha and Isaac Atencio (WM-WGS), who are members of the LANSCE Facility Operations (LANSCE-FO) Environmental, Safety, and Health Support Team; and Heather Apodaca (Environmental Stewardship, EPC-SC) and Gilbert Coriz (Radiation Protection Field Support, RP-FS), members of the LANSCE-FO Health Physics Team.



Photos showing some of the materials safely removed as part of the silver-award-winning proton storage ring cleanout project.



The Motorcycle Safety Committee strives to combine motorcycle safety and environmental awareness with its ongoing anti-littering campaign through its Adopt-a-Highway Program. Here, members of the team are shown participating in the Great Garbage Grab in support of Earth Week.



Anti-litter campaign nets Bronze Award

Liz Sturgeon (Science Program Office-Office of Science, SPO-SC) and her Jemez Riders teammates, a branch of the Motorcycle Safety Committee, received a Bronze Award in recognition of the team’s anti-littering and adopt-a-highway efforts. This includes continuous maintenance of sections of New Mexico State Road 4 and its Great Garbage Grab in support of Earth Week. The team includes members of ALDW, Environment, Safety, Health, Quality, Safeguards, and Security (ALDESHQSS), Facility and Operations (ALDFO), Weapons Production (ALDWP), Business Management (ALBUS), Weapons Physics (ALDX), and Capital Projects (ALDCP) directorates and Newport News Nuclear BWXT (N3B). ■

Putting a face on a career at the Laboratory

Signage touts variety of professions available inside, outside science at Lab

Next time you're driving between Los Alamos, Santa Fe, or Albuquerque, you might just see one of your colleagues featured on a big blue billboard posted along the side of the road. A combined effort by Human Resources, Communications and External Affairs, and the Associate Laboratory Directorate for Weapons Production, the billboard campaign is designed to invite New Mexico residents to consider working at the Lab—and to know that doing so doesn't necessarily require a science degree. The "careers for everyone" campaign is aimed at getting the attention of everyone from business professionals to manufacturers to college students carving out their career paths. Both Wanyi Nie (Center for Integrated Nanotechnologies, MPA-CINT) and Alejandra Loya-Munoz (Radiation Protection Field Support, RP-FS) were featured in the campaign.

A physicist and materials scientist by training, Nie joined Los Alamos in 2013 as a postdoctoral researcher in the Materials Physics and Applications Division studying organic materials for photovoltaics.

She now leads a team developing hybrid perovskite materials for a variety of clean energy and detector technologies. Nie said she believes her ideas are within reach at Los Alamos, where as a member of a thriving, complex, interdisciplinary organization she has access to collaborators in a variety of

fields. New x-ray detector technology developed by Nie and her Los Alamos and Argonne national laboratory collaborators was among *Physics World's* top 10 science breakthroughs of 2020.

"It's my pleasure to participate in the campaign to represent LANL's 'careers for everyone,'" Nie said. "LANL provides an unparalleled research environment with world-renowned experts and advanced resources and facilities, where I can chase after cutting-edge ideas without restraint."

Loya-Munoz started her Los Alamos career in 2014 as an undergraduate student admin in the then Theory, Simulation, and Computation Directorate. With the help of supportive mentors, Loya-Munoz said she was able to transition to work in the health, safety, and environmental field, which had interested her.

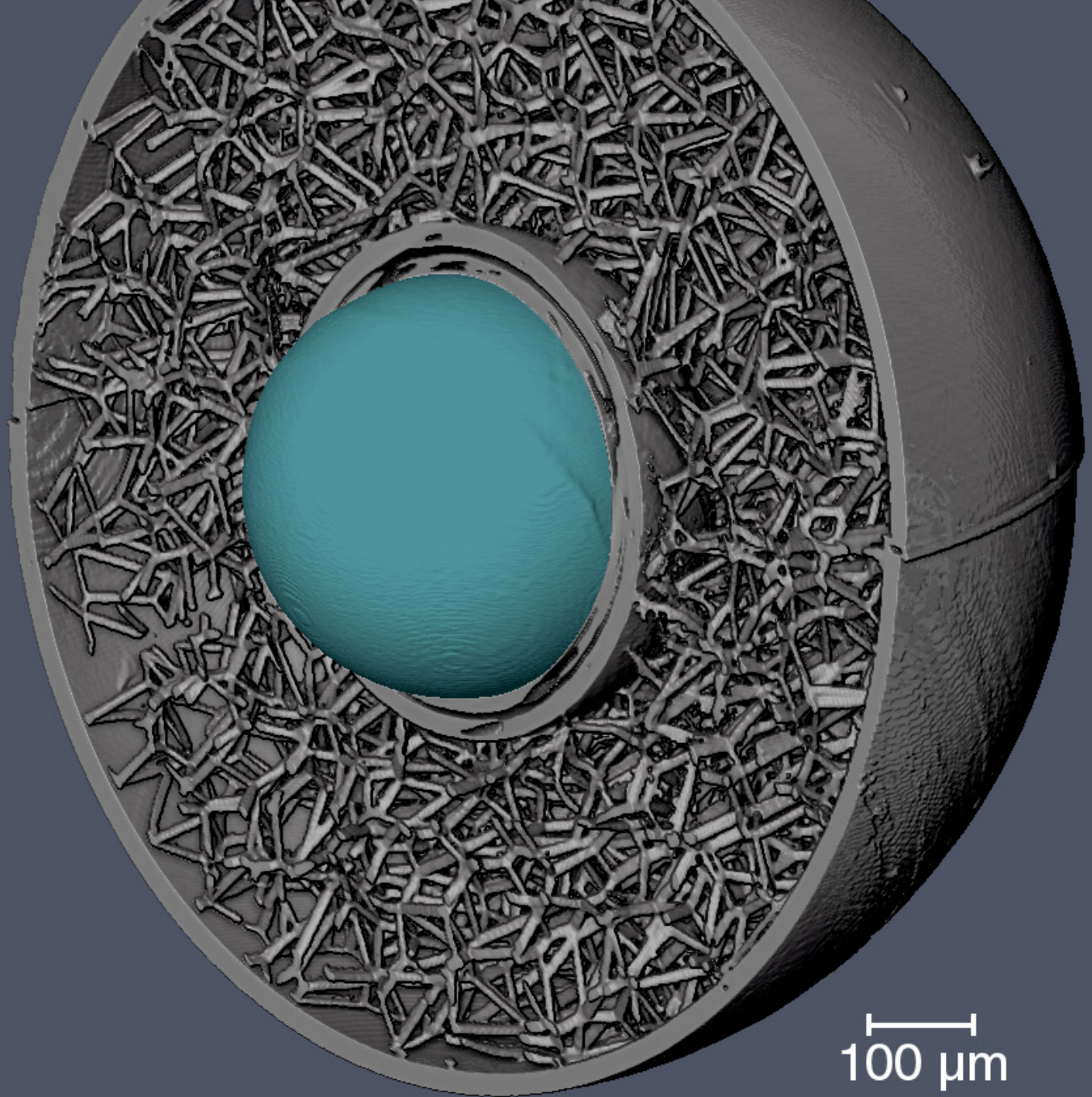
She is now a member of the Health Physics Team deployed to LANSCE Facility Operations, where she supports safe and efficient operations on the Los Alamos Neutron Science Center mesa. "This campaign is a great way to advertise some of the career opportunities available at Los Alamos National Laboratory," she said. "The billboards feature local New Mexicans succeeding at the Laboratory, and I am grateful to be one of these individuals." ■



The "careers for everyone" campaign aims to attract the attention of everyone from business professionals to manufacturers to college students carving out their career paths.



Photo subjects (clockwise from top left): Wanyi Nie; Amanda Quintana and Erick Acevedo; Alejandra Loya-Munoz; Erika Martinez-Montoya; Quintana and Acevedo; Mark Smith; and Adriana Reyes-Newell, Roberta Beal, Lisa Danielson, Nina Lanza, and Cindy Little.



A micro x-ray computed tomographic image—virtually sliced open—of a 3D printed capsule. The capsule was designed and printed by Engineered Materials scientists using 2-photon nanolithography. The entire capsule is 1.146 mm in diameter and contains an inner chromium shell (turquoise) coated with a 60- μm -thick layer of plastic and held in place on center to the outer shell using an ultra-low-density, 5- μm -ligament-thickness lattice. This work was funded by the Los Alamos Laboratory Directed Research and Development Program and is used as a proof of concept for future Omega Laser Facility and National Ignition Facility experimental platforms.

Associate Laboratory Director for Physical Sciences: Antoinette J. Taylor

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